RITTEC:
Empowering circularity

revolPET® - Closed Loop Recycling für Polyestertextilien

Carsten Eichert

DiTex -Auf dem Weg zur zirkulären Textilwirtschaft
Berlin, 20. Oktober 2022

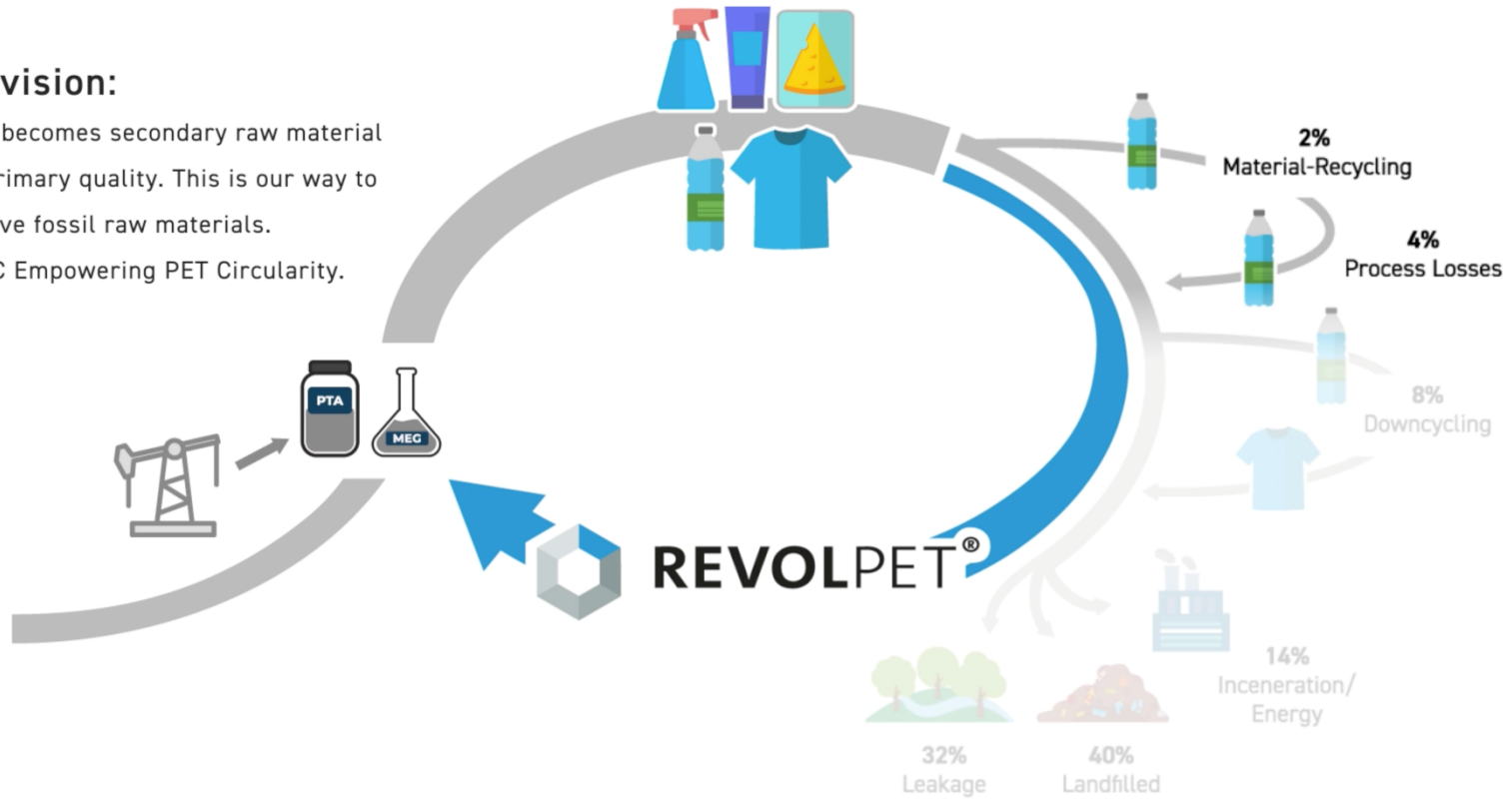
RITTEC – Empowering PET circularity

Bringing up to 90% of lost PET to circularity

RITTEC

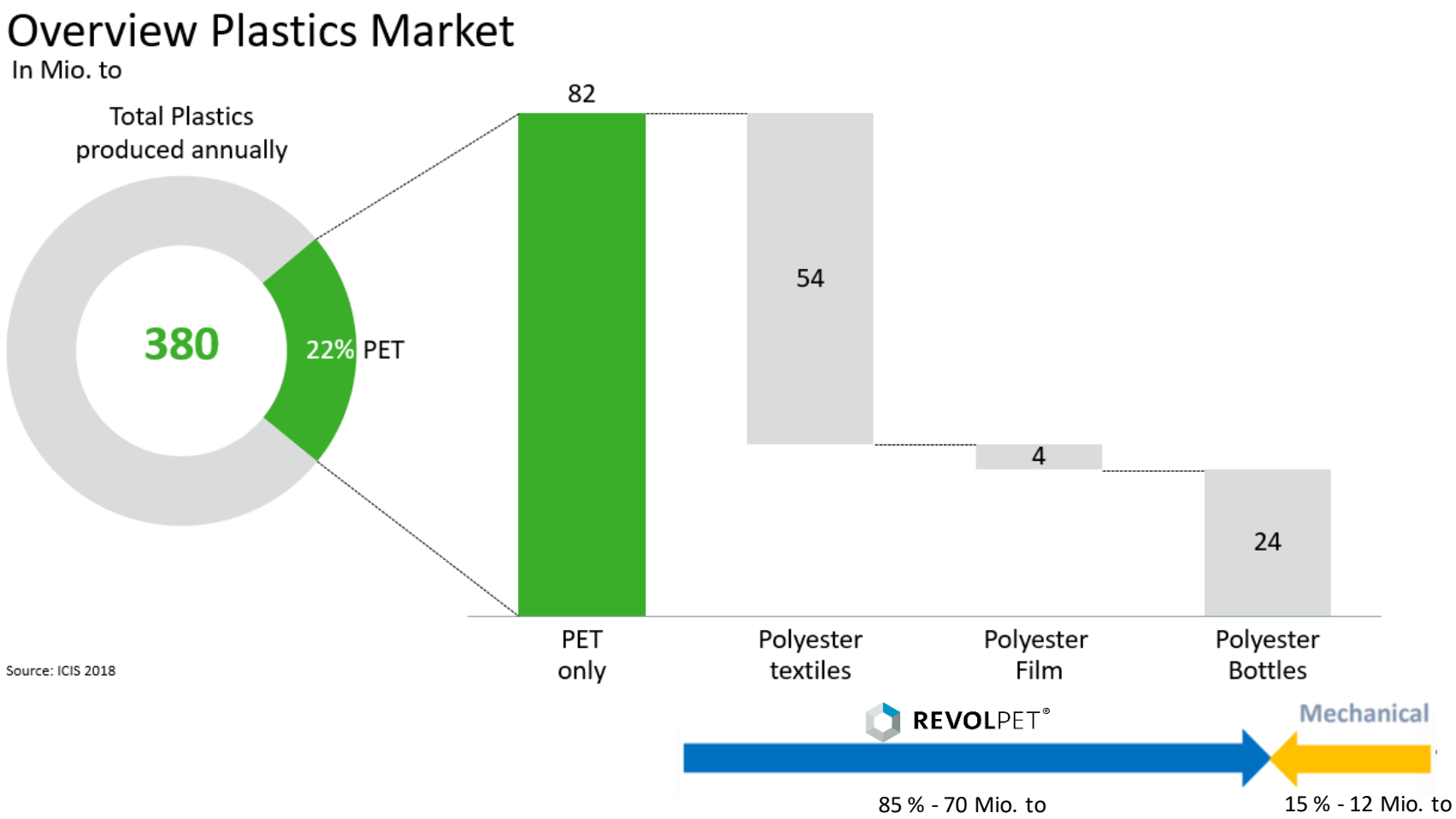
Our vision:

Waste becomes secondary raw material with primary quality. This is our way to preserve fossil raw materials.
RITTEC Empowering PET Circularity.



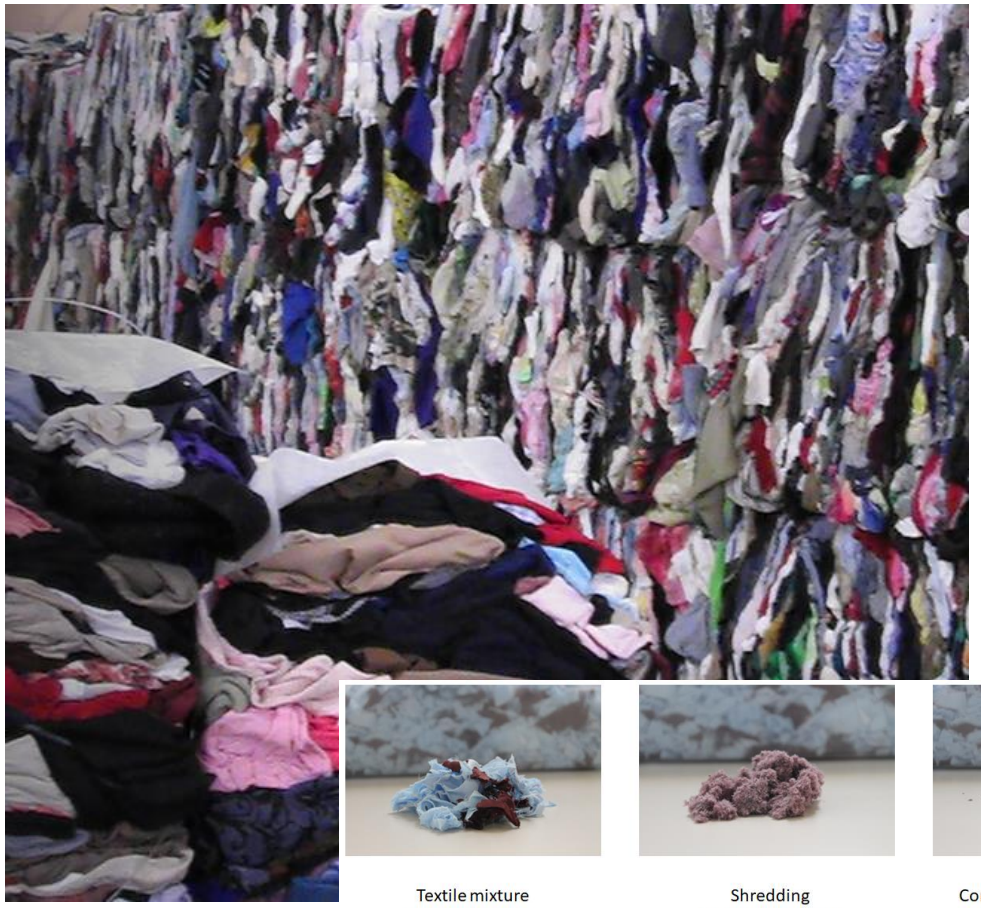
Market potential: 82m t look for circularity

RITTEC's revolPET® technology recycles 85% of it



revolPET® process: simplicity convinces

steady and scalable – ecological and economical



Textile mixture
ca. 80 % Polyester
ca. 20 % Cotton

Shredding
bulk density 40 g/L

Compaction in pellet press
bulk density 400 g/L

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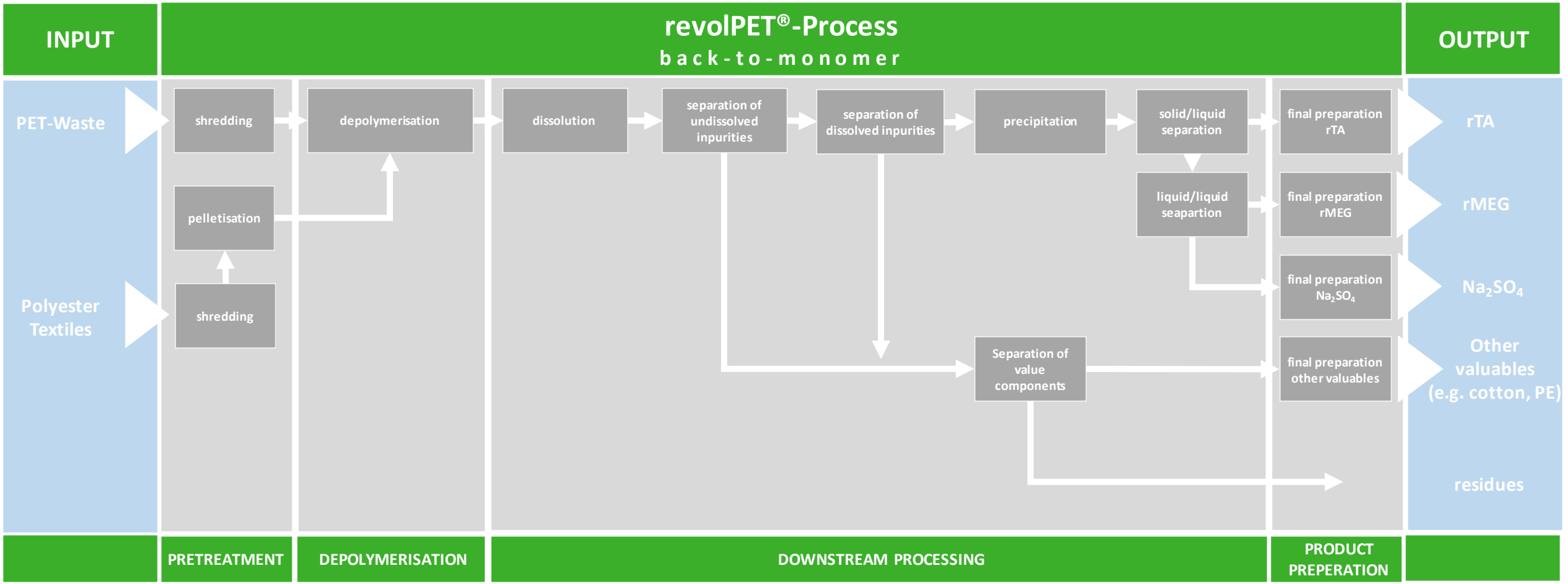
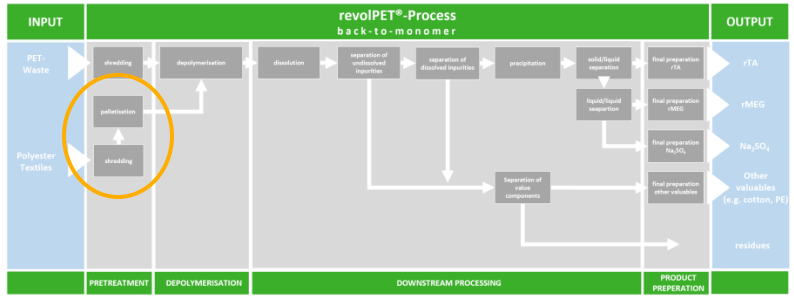


revolPET® process

Pre-treatment of textiles



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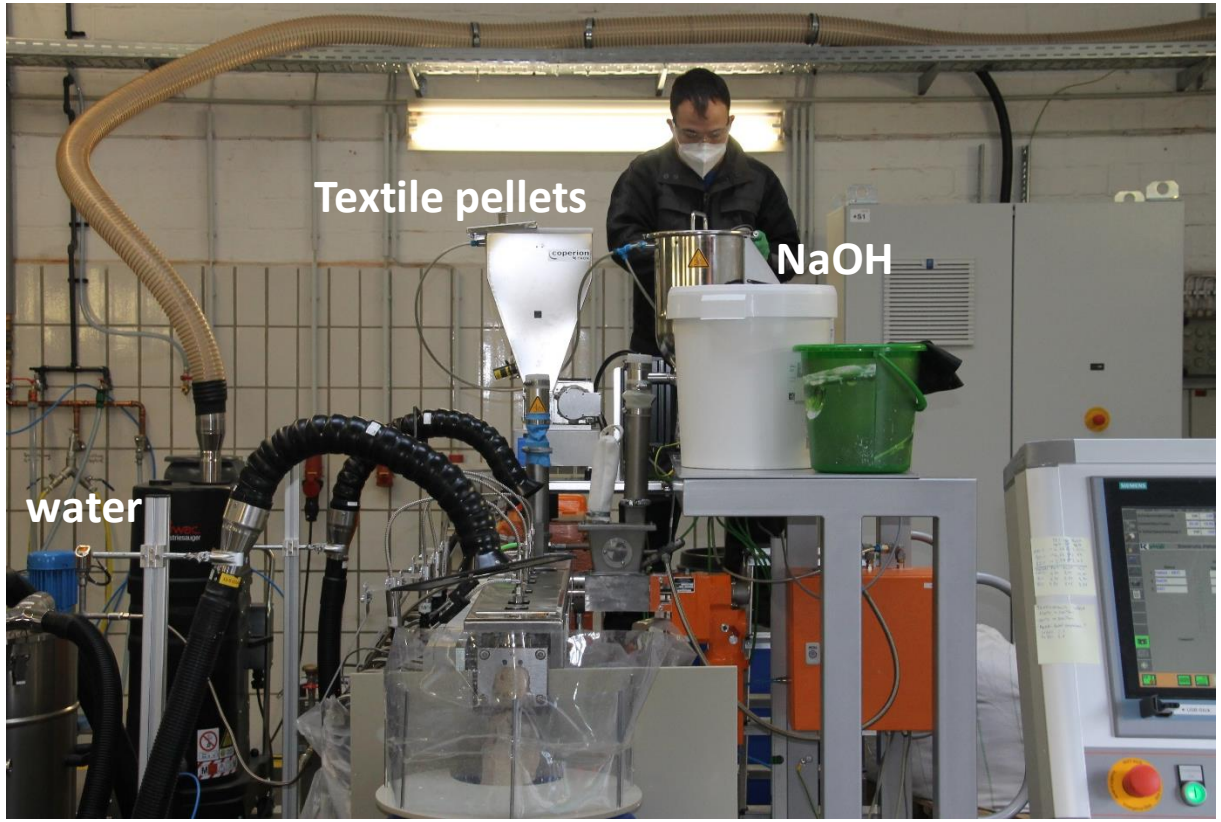
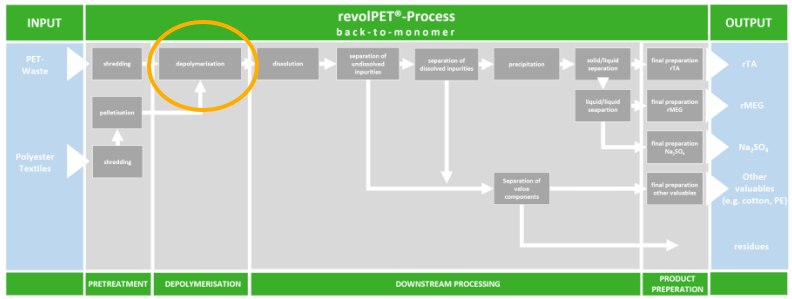
revolPET® process

Basic chemicals guarantee recycling success





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Intermediate product consisting of

- Disodium terephthalate
- Monoethyleneglycol
- Cotton fibers
- water
- excess NaOH

revolPET® process

Mass balance of value defining inputs and outputs

Material Flow	Input (kg/h)	Output (kg/h)
PET / Polyester	1000	
Sodium Hydroxide	436	
Sulphuric Acid	510	
Terephthalic Acid		839
Ethylene Glycol		322
Sodium Sulphate		645

All values confirmed in pilot plant; to be confirmed in miniplant

Product quality

Basis for circularity and marketability

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Terephthalic acid

		r-TA	Virgin PTA	Industry Specification
Color L*	[-]	95	95	
Color a*	[-]	-0.1	-0.4	
Color b*	[-]	1.5	1.5	<2
Moisture	[%]	0.1	0.1	<0.2
4-CBA	[ppm]	<5	10	<25
p-TA	[ppm]	29	160	<170
IPA	[%]	1.4	0	

Monoethylene glycol

		r-EG	Virgin MEG	Industry Specification
Color L*	[-]	100		
Color a*	[-]	0.0		
Color b*	[-]	-0.2		
Moisture	[%]	1.3	0.05	<0.05
Hazen	[-]	1	1	<5
DEG	[%]	1	0.03	<0.05

Product quality

Basis for circularity and marketability

	Melt				SSP		
	IV [dl/g]	L* [-]	a* [-]	b* [-]	L* [-]	a* [-]	b* [-]
50% r-TA	0.615	81.9	-1.2	2.6			
100% r-TA, 100% r-MEG	0.591	82.1	-0.9	8.0	83.1	-0.5	9.3
Virgin PTA	0.606	88.1	-1.6	5.5	87.9	-1,7	5.3

Produced r-PET is compliant with safety requirements of article 3 of Regulation (EC) No 1935/2004 (**food-grade quality**).

revolPET® process: simplicity convinces

steady and scalable – ecological and economical

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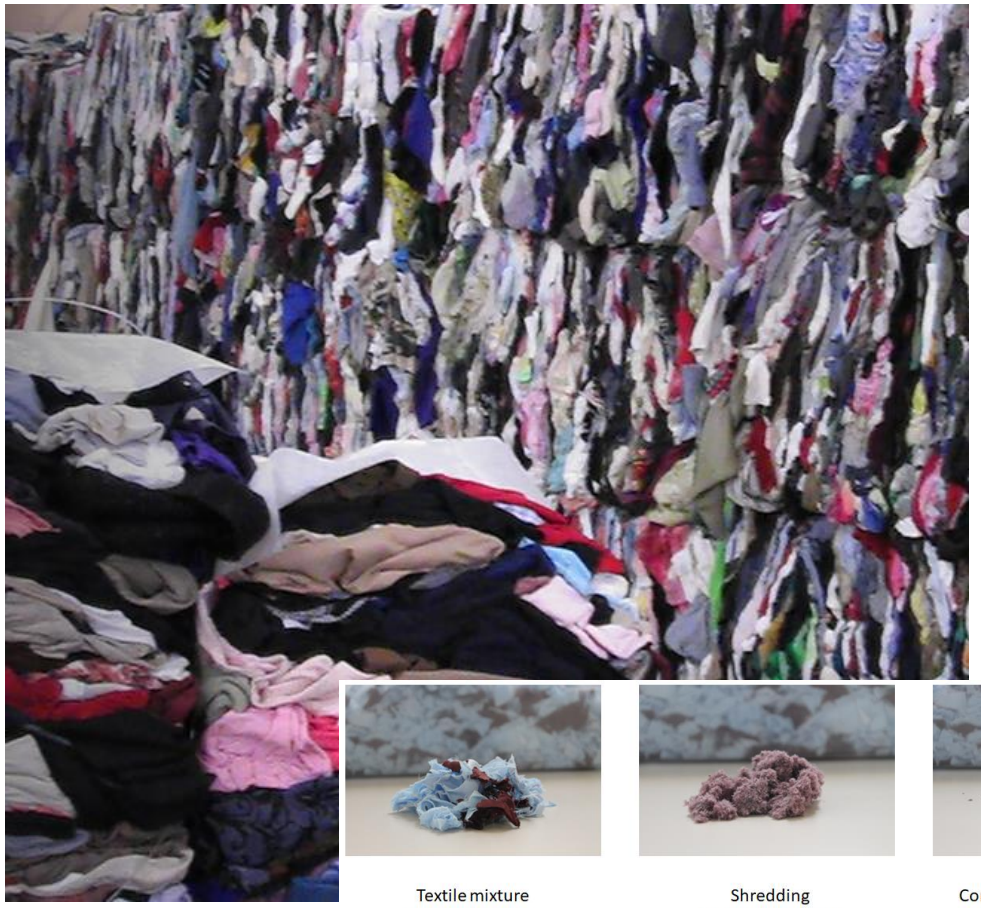

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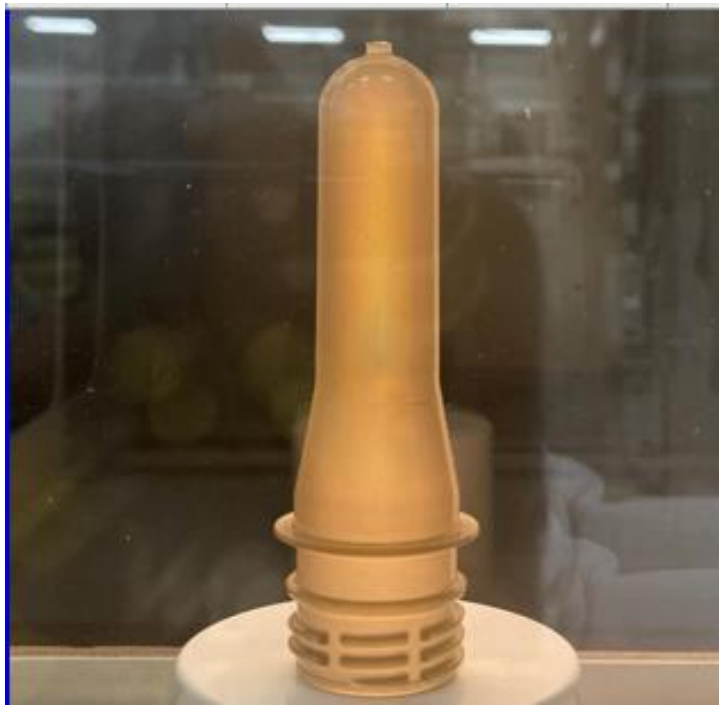
Product quality

First pre-forms from PET out of RITTEC's r-monomers



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Mechanical and physical characteristics are fulfilled

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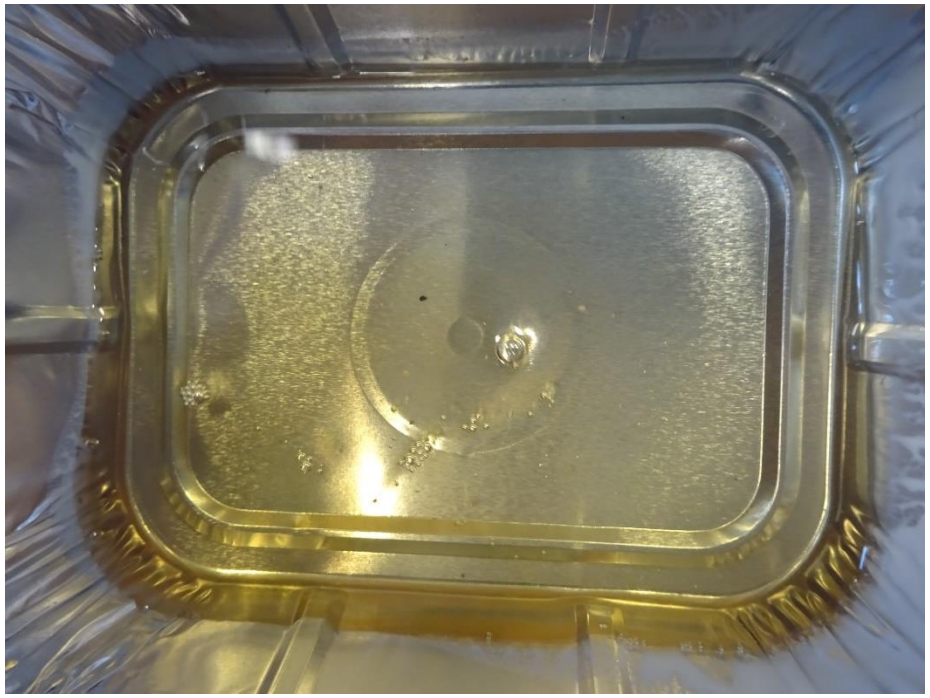
Left: form v-monomers; **right:** from r-monomers

Opaqueness due to high sodium sulphate concentration in r-TA

Product quality of RITTEC's r-monomers

polyester yarn from post-consumer polycotton shirts

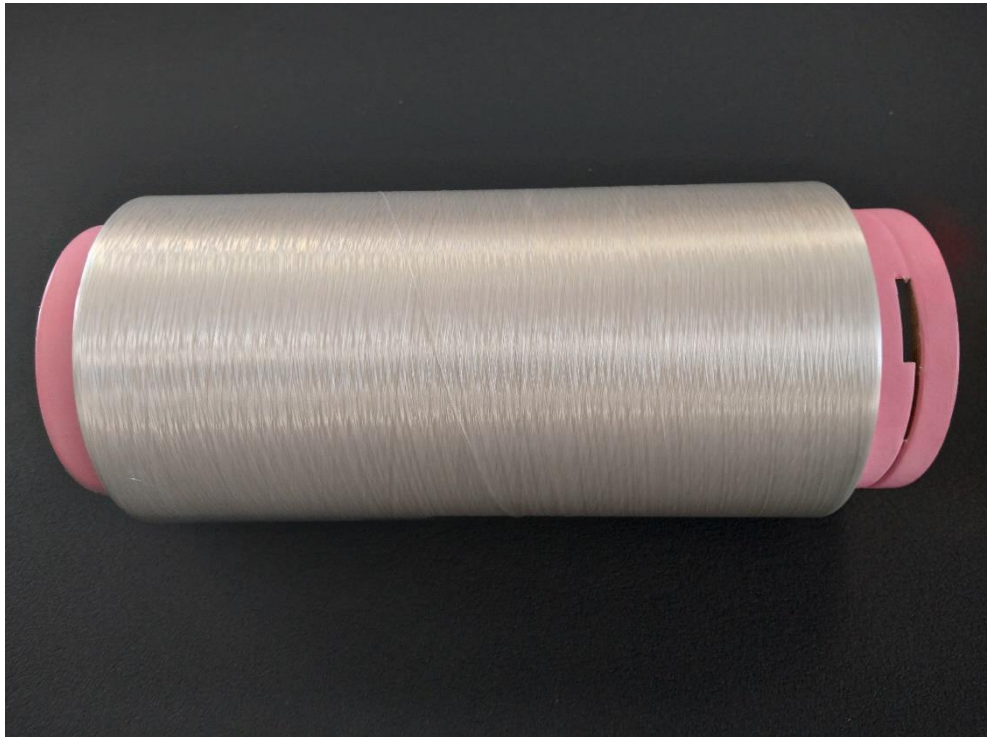


Mechanical and physical characteristics are fulfilled

Left: from r-monomers; **right:** from v-monomers

Product quality of RITTEC's r-monomers

new fabrics from post-consumer polycotton shirts



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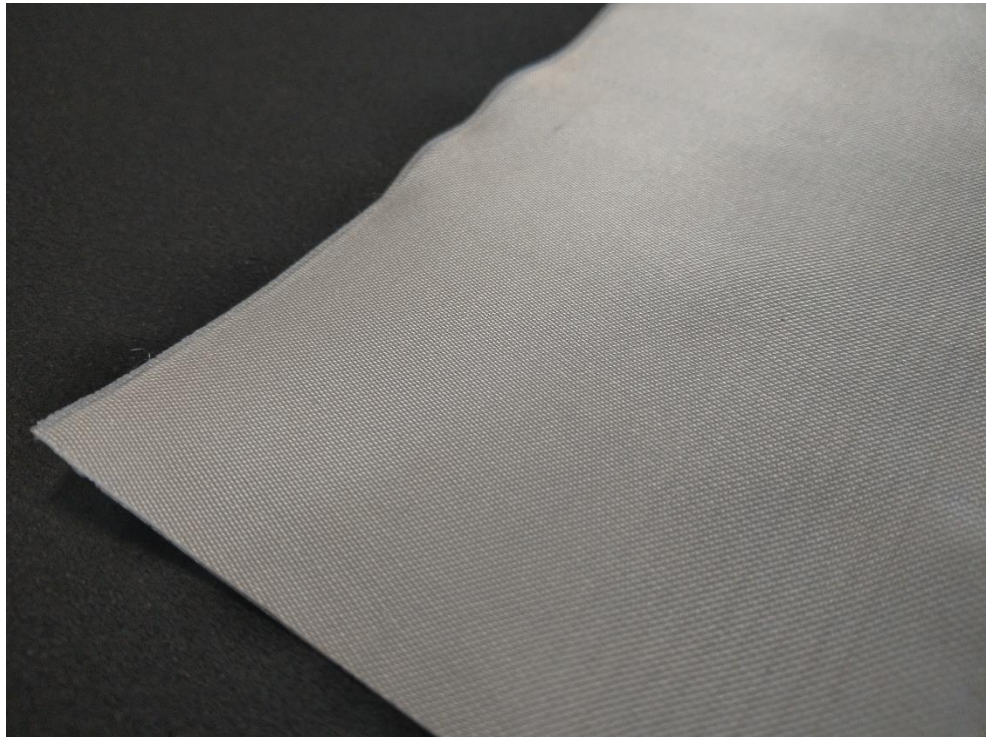

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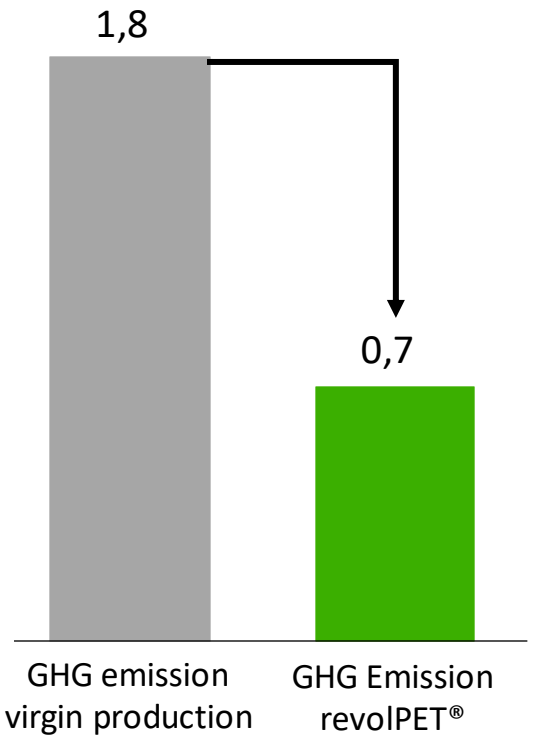
revolPET® technology

Competitiveness is the benchmark

in CO_2-eq./kg r-TA



KPIs

- Process temperature: 120° to 160°C
- Yield: 97%
- Depolymerisation time: < 1 Minute
- No solvents, no catalysts
- All kinds of PET/polyester waste

Main characteristics

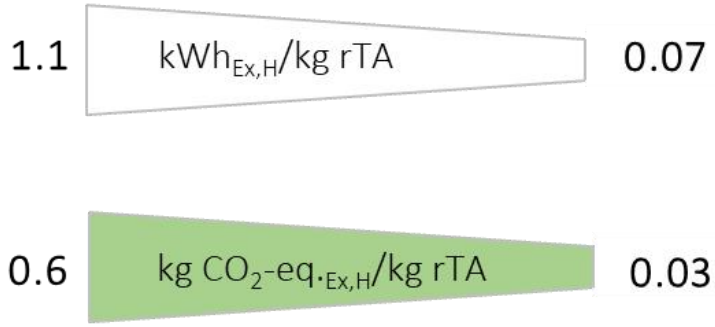
- Stable and continuous process
- Energy efficient; low process temperature; complete use of exothermal energy; most of “waste” fractions can be recycled further
- Use of scalable standard equipment
- r-monomers substitute 1:1 monomers from fossil resources
- PET from r-monomers has food- grade quality
- Return on Sales at 15% (price base: virgin monomers, no recycling premium!)

revolPET® technology – ecological effects

Scenario 2 – scaling effects

10 kg input /h

Extruder @pilot plant
(Braunschweig, Germany)



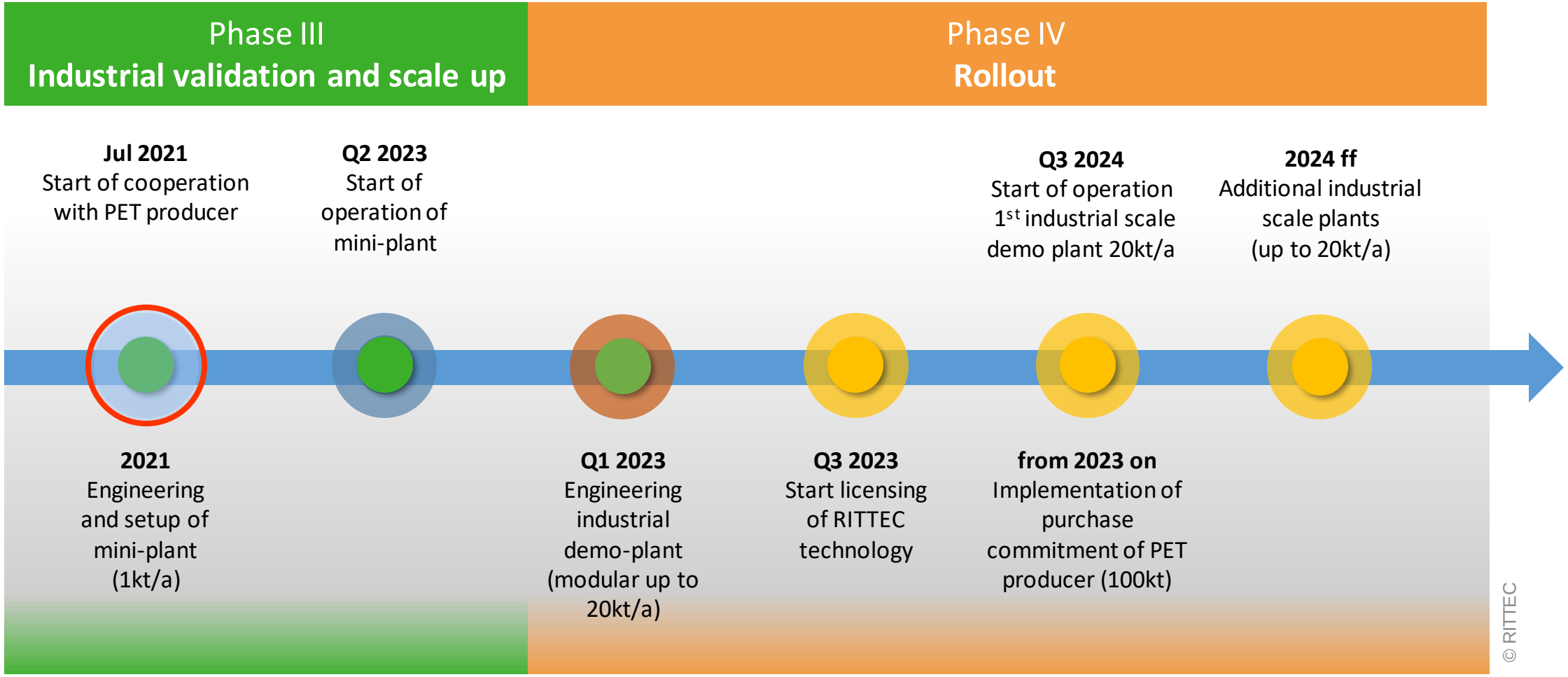
180 kg input/h

Extruder@technical lab
Leistritz AG
(Nürnberg, Germany)

- Scale up test shows a significant reduction in consumption related to the heating
- In principle, an established technology on a larger scale will have lower consumption than an earlystage technology

The path to marketability

Roadmap to industrial capacity



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